

Analgesia/Nociception Index May Not Be an Ideal Surrogate Postoperative Pain Measurement Tool for Burn Injury Patients Undergoing Propofol-Based General Anesthesia

Dear Editor,

The analgesia/nociception index (ANI) is suitable for excluding severe pain because it is associated with a high negative predictive value^{1,2} and it is commonly used in clinical anesthesia.^{3,4} In addition, Boselli *et al.* reported that ANI is a reliable modality for evaluating immediate postoperative pain.⁵ Herein, we present two cases for which ANI was used in the postanesthesia care unit (PACU) for postoperative pain assessment with totally reciprocal representations.

Case 1 was that of a 20-year-old male with second-degree burns on the lower legs involving about 38% total body surface area (TBSA) due to a boiler explosion, who underwent total intravenous anesthesia (TIVA) using propofol and remifentanyl for debridement.⁵ He complained of severe pain (numeric pain rating scale [NRS] 10/10) when arriving at the PACU, and ketamine 50 mg was administered. Four days later, he underwent the same procedure under TIVA with an identical regimen. He complained of an excruciating pain (NRS 10/10) on arriving at the PACU again, and the ANI value was 67–70.

Case 2 was that of a 69-year-old female who underwent TIVA for second-degree scald injury (about total 6% TBSA) wound debridement and split-thickness skin grafting in the lower legs. ANI was monitored after deep removal of laryngeal mask airway on arrival to the PACU. Severe pain intensity was rated (NRS 8/10) at a very clear consciousness level during transportation to the PACU, and the ANI values reached 99 on arrival [Figure 1].

These two cases show that ANI value does not reflect clinical reality in the PACU accurately after propofol-based TIVA. This distinct phenomenon might be explained by the findings of the study by Joo *et al.*;⁶ they suggested that autonomic nervous system dysfunction interferes with pain threshold in patients with burns. Burn patients are exposed to a sympathetic predominance and decreased parasympathetic activity in circadian rhythm, which possibly decrease the pain threshold and increase pain sensitivity. Aside from the decreasing subjective pain threshold, ANI value is calculated from heart rate variability and correlated with parasympathetic predominance,⁷ which is in contrast to what is observed in burn patients. In addition, burn-related pain is complex and involves many factors, including esthetic appearance, social relationships, and physical and psychological function, and,



Figure 1: The analgesia/nociception index value reaches 99 while the patient complained of severe pain (numeric pain rating scale 8/10) in the postanesthesia care unit

therefore, it is notoriously difficult to measure. Repetitive debridement and daily wound care throughout the healing process may arouse anxiety and emotional distress, which progress over time and cause long-term pain management problems.⁸ In addition, opioid analgesia remains the mainstay of pain treatment in burn patients, which makes tolerance issue highly possible after prolonged exposure. For postoperative analgesia, these two cases received intravenous tramadol every 8 h and parecoxib in 12-h interval. Moreover, remifentanyl-induced hyperalgesia should be considered although gradual withdrawal modality was applied.⁵

Although ANI performed significantly better in those undergoing propofol-based TIVA compared with those receiving halogenated agents, longer duration of exposure to halogenated agents may blunt ANI accuracy, and ANI is suitable for excluding severe pain because it is associated with a high negative predictive value.^{1,2} The two cases presented herein show that for burn patients undergoing TIVA with propofol and remifentanyl, ANI may not be an ideal evaluation tool for postoperative pain accurately in the PACU. Therefore, the accuracy of ANI for acute postoperative pain after different anesthetics is still controversial, hence further investigation is needed to corroborate our observation.

Informed consent

The patients' consent for publication was obtained.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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REFERENCES

1. Ledowski T, Tiong WS, Lee C, Wong B, Fiori T, Parker N. Analgesia nociception index: Evaluation as a new parameter for acute postoperative pain. *Br J Anaesth* 2013;111:627-9.
2. Boselli E, Jeanne M. Analgesia/nociception index for the assessment of acute postoperative pain. *Br J Anaesth* 2014;112:936-7.
3. Chen SY, Wu ZF, Yang MT, Lai HC, Hung NK. Is analgesia nociception index monitor suitable for post-heart transplant patients under general anesthesia? *J Med Sci*. DOI: 10.4103/jmedsci.jmedsci_197_19.
4. Boselli E, Daniela-Ionescu M, Bégou G, Bouvet L, Dabouz R, Magnin C, *et al.* Prospective observational study of the noninvasive assessment of immediate postoperative pain using the analgesia/nociception index (ANI). *Br J Anaesth* 2013;111:453-9.
5. Wu TS, Wu HC, Wu ZF, Huang YH. Nalbuphine sebacate interferes with the analgesic effect of fentanyl. *J Med Sci* 2020;40:101-2.
6. Joo SY, Hong AR, Lee BC, Choi JH, Seo CH. Autonomic nerve activity indexed using 24-h heart rate variability in patients with burns. *Burns* 2018;44:834-40.
7. Luo J, Min S. Postoperative pain management in the postanesthesia care unit: An update. *J Pain Res* 2017;10:2687-98.
8. Yuxiang L, Lingjun Z, Lu T, Mengjie L, Xing M, Fengping S, *et al.* Burn patients' experience of pain management: A qualitative study. *Burns* 2012;38:180-6.

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